

REMARKS

The Office Action dated June 5, 2003, has been carefully considered by applicant. Applicant believes, however, that a truly patentable invention is presented and reconsideration of the patentability of the claims is respectfully requested.

In the Office Action, claims 1-11 were rejected under 35 U.S.C. § 102(b) as being anticipated by Cronin (U.S.P.N. 3,703,664).

The cited Cronin '664 patent discloses a circuit for limiting current that utilizes one or more superconductors. Superconductors have essentially no resistance at temperatures very close to absolute zero. When a superconductor's temperature rises above a transition temperature of the superconducting material, the superconductor switches to a resistive state. Alternatively, a superconductor's state can be switched from a superconducting state to a resistive state by subjecting it to a magnetic field that is stronger than a threshold value for that superconductor material and shape. As Cronin notes, superconductors have been proposed as components in circuit interruptors where they are switched to their resistive state by either heat or a magnetic field in order to introduce resistance to a current carrying circuit in order to limit that current. The switching time of a superconductor to a resistive state is extremely short, so superconductors are useful in applications that require very fast introduction of an impedance to a circuit.

In the embodiment shown in Fig. 4 of the Cronin '664 reference, current normally flows through the superconductor 31 and pilot superconductor 32 into the load 12. Because this path offers very little resistance to the current flow under normal operation of the circuit, no current normally flows through impedance 30. If the current flowing through the superconductors becomes too great, for instance in the case of a short circuit in place of load 12, the current generates a magnetic field that is greater than the threshold for the pilot superconductor 32. This greater magnetic field switches superconductor 32 into its resistive state, causing it to generate heat, which is transmitted by thermal link 35 to superconductor 31. Superconductor 31, in response to the heat generated by pilot superconductor 32, also switches to its resistive state. The combined effect of

superconductors 31 and 32 switching to their resistive states pushes most of the current in the circuit through impedance 30. Thus, the operation of the superconductors 31 and 32 is controlled directly by the amount of current flowing through the load. A careful comparison of Cronin's fourth embodiment to applicant's invention reveals that applicant's invention is not at all anticipated by Cronin for reasons that will be made clear in the following discussion of the applicant's claims.

Claims 1-8

Regarding the applicant's claim 1, the Cronin '664 patent teaches a first superconductor (31), a second pilot superconductor (32) and an impedance (30) positioned serially between a source (10) and a load (12). These components do not function as a switching device that is operable in response to a remotely generated activation signal to move between an open and a closed position, as required by claim 1. Rather, superconductors 31 and 32 operate in either a superconducting mode or a resistive mode based directly on the amount of current flowing through the load. The mode of operation of the superconductors is determined solely by the current flowing from the source (10) to the load (12). Cronin discloses no means to switch the state of the superconductors in response to any remotely generated stimulus.

The applicant's invention, as specified by claim 1, is specifically designed to open an external circuit breaker in response to a remotely generated activation signal, independent of the current flowing through the circuit's load.

The applicant's invention may thus be controlled by a low voltage external activation signal, such as a signal from a microprocessor or similar component. In contrast, Cronin's fourth embodiment is controlled only by the full current flowing through the load. For these reasons, the applicant respectfully traverses the examiner's conclusion that Cronin '664 reference anticipates applicant's claim 1.

Claims 2-8 depend directly or indirectly from claim 1 and are believed to be allowable based upon the above arguments for allowance, as well as in view of the subject matter of each claim.

Regarding claim 2, Cronin does not disclose an electronic relay operable between an open and a closed position. Cronin's disclosure is directed at a superconductor-based current limiter; no mention is made of a relay.

Regarding claim 3, Cronin does not disclose a switching circuit coupled to a switching device. Applicant discloses a circuit capable of receiving a signal external to the circuit comprising the power source 14 and load 16 and using this signal to control switch 10. In contrast, Cronin's circuit reacts only to changes in current flowing from power source to load.

Regarding claim 6, Cronin discloses an impedance limiter that is at all times in series with the load. In no place does Cronin disclose an impedance in parallel to the load, as applicant has done. By connecting the device in parallel to the normal load, rather than in series with it as taught by the Cronin reference, applicant discloses a means for easily controlling a circuit remotely from the external circuit breaker and remotely from the load. This invention could be added to a live circuit at any time. In contrast, Cronin's embodiment could not be added to a circuit without first interrupting the current flow in the circuit.

Claims 9-11

In the Office Action, the Examiner relied upon the Cronin reference to reject independent claim 9. By the present amendment, independent claim 9 has been amended to more specifically state that the switching device is moved between the open and closed positions by supplying an activation signal to the switching device, where the activation signal is used to remotely actuate the switching device. As discussed above in the arguments for allowance of claim 1, the Cronin reference teaches the transition of a pair of superconductor devices between their resistive and non-resistive states based solely

upon the amount of current flowing through the circuit, and specifically through the load. Thus, the superconductors taught by the Cronin reference respond directly to the amount of current flowing through the circuit and cannot be remotely controlled by an external activation signal, as required by independent claim 9.

As discussed above in the arguments for allowance of claim 1, the supply of a remote activation signal to the switching device allows the switching device to be remotely controlled to move between its opened and closed positions. Clearly, the Cronin reference does not teach or suggest, nor render obvious, the use of such switching device to effectively insert an impedance limiter to trip a circuit protection device.

Further, claim 9 requires the impedance limiter to be connected in parallel with the load across the power source. In the Cronin reference, the first superconductor, the second superconductor and the impedance are connected serially between the source and the load. By connecting the impedance limiter in parallel with the normal load, rather than in series as taught by the Cronin reference, the method of claim 9 can control a circuit with a remotely generated activation signal.

Based upon the above arguments for allowance, independent claim 9 is believed to be in condition for allowance and such action is respectfully requested.

Claims 10-11 depend directly or indirectly from claim 9 and are believed to be allowable based upon the above arguments for allowance, as well as in view of the subject matter of each claim.

Conclusion

Accordingly, for the foregoing reasons, the applicant believes that Cronin in no way anticipates the applicant's invention under 35 U.S.C. § 102(b), as described by the amended claims.

The Examiner is invited to contact applicant's undersigned attorney with any questions or comments, or if further clarifying amendment is deemed appropriate, or otherwise to facilitate prosecution.

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It is believed that this application is currently in a condition for allowance of claims 1-11, and such action is earnestly solicited.

Respectfully submitted,

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